

Abstract of the Disclosure

[0053] Methods of forming a tapered evanescent coupling region for use with a relatively thin silicon optical waveguide formed with, for example, an SOI structure. A tapered evanescent coupling region is formed in a silicon substrate that is used as a coupling substrate, the coupling substrate thereafter joined to the SOI structure. A gray-scale photolithography process is used to define a tapered region in photoresist, the tapered pattern thereafter transferred into the silicon substrate. A material exhibiting a lower refractive index than the silicon optical waveguide layer (e.g., silicon dioxide) is then used to fill the tapered opening in the substrate. Advantageously, conventional silicon processing steps may be used to form coupling facets in the silicon substrate (i.e., angled surfaces, V-grooves) in an appropriate relation to the tapered evanescent coupling region. The coupling facets may be formed contiguous with the tapered evanescent coupling region, or formed through the opposing side of the silicon substrate.